PATENT SPECIFICATION

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737,726

Date of Application and filing Complete Specification: July 9, 1953.

No. 19130/53.

Complete Specification Published: Sept. 28, 1955.

Index at acceptance:—Class **108(2)**, D2A2(A:B:E), D6E.

COMPLETE SPECIFICATION

Improvements in or relating to Spring Suspension Systems for Vehicles

We, A.E.C. LIMITED, a British Company, of Southall, Middlesex, and THE BRITISH TRANSPORT COMMISSION, a Body constituted under the Laws of Great Britain, of 55, Broadway, Westminster, London, S.W.1, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to spring suspension systems for vehicles and particularly for public service passenger road vehicles or for medium or heavy goods vehicles or for heavy motor cars.

According to this invention a spring suspension for a vehicle comprises a fore and aft extending beam on each side of an underframe or body of the vehicle, a pivotal connection between each beam and said underframe or body, so as to permit relative up and down swinging movement between those parts, a mounting for a vehicle wheel on each beam, a vertically acting spring between the outer end of each beam or a part secured thereto and the underframe or body resisting said swinging movement, and means other than the wheel axle for connecting the two beams together near said springs so as to limit the differential swinging thereof. The said means may comprise a torsion bar.

One of the objects of the invention is to provide soft and comfortable springing while limiting the degree of roll of the vehicle underframe and body relatively to the vehicle wheels to a predetermined extent. It will be appreciated that the resistance to roll of a vehicle body depends mainly on two factors, the stiffness or rating of the spring system associated with each wheel and the effective distance of the spring systems from the central fore and aft axis of the vehicle as viewed in plan. Thus if the effective distance of the spring system from the central fore and aft axis is small the rating or stiffness of spring will require to be high in order to limit the roll to the required degree and thus the springing will feel harsh and uncomfortable to the passengers. Therefore, the greater is the effective distance of the spring system from the central axis, the softer can be the springing but this distance heretofore has been limited by the fact that with most known arrangements the spring system for each wheel has of a necessity been disposed on the inner side of the wheel, and in the case of a steerable wheel the spring system has required to be disposed beyond the inner limit of travel of the edge of the wheel.

In the spring system as set out above, the resistance to roll of the body and underframe about the wheel is applied to the underframe where the spring abuts the underframe and where the beam is pivotally connected to the underframe. It is convenient to consider a single roll resisting force disposed immediately opposite the axis of rotation of the wheel as viewed in plan, and the actual point along the axis at which this resistance acts is at the crossover point of a line passing through the pivot axis of the beam and the point of engagement of the spring with the underframe. The roll resisting force at this point will hereinafter be referred to as "the effective roll resisting force of the system." Another factor which requires to be taken into consideration when determining the strength or rating of the spring is the distance of the spring from the pivotal connection of the beam to the underframe and the load which it is required to support.

The extent of roll may be diminished and the stiffness of springs increased without road shocks being transmitted to the underframe by arranging that the point of application for the force of the spring on the underframe and/or the pivotal attachment of the beam to the underframe to be disposed outside a vertical fore and aft plane containing the inner face of the wheel.

Preferably each said spring between a beam and the underframe is arranged on the opposite

[*Price 3s. 0d.*]

Price 4s 6d

side of the wheel to the pivotal attachment of the beam to the underframe or body.

In one construction according to the invention, each said beam is arranged to extend parallel with the central longitudinal fore and aft axis.

Each spring between a beam and the underframe may be supported at one end by a part constituting an extension of said connecting means for the two beams and at the other end is supported on said underframe. The spring may take various forms such as a helical compression spring, a leaf spring, or a system embodying a compressible fluid. In the case where a leaf spring is employed, the aforesaid part may be dispensed with and the spring may be anchored at one end to the beam so as to extend laterally thereof while the other end may engage the vehicle underframe.

In any of the arrangements referred to above, each bearing or stub axle may be resiliently mounted on its beam. Also in any of the arrangements referred to above, the pivotal mounting of each said beam on the underframe is preferably arranged to be torsionally resilient about a fore and aft axis.

The following is a description of the invention as applied to a spring suspension system for the back wheels of a public service road vehicle, reference being made to the accompanying drawings, in which:—

Figure 1 is a plan view of a spring suspension system; and

Figure 2 is a sectional elevation of the system on the line 2—2 of Figure 1.

As will be seen, dual wheels 10 are arranged on each side of the vehicle which wheels are mounted on a shaft 11, carried in bearings 12 at the end of an axle casing part 13. Each axle casing part end is fixed to a carrier 14 extending fore and aft of the shaft 11, and the two ends of each carrier are secured to a beam 15 by means of a resilient mounting 16. Each of the beams 15 is pivotally connected to a part 17 of the underframe of the vehicle by means of a resilient bush 18 and pivot pin 19. Each axle casing part 13 extends in a conventional manner to one side of differential casing 20, and the axle is located laterally in relation to the underframe by a link rod 21 pivotally connected at one end to the differential casing and at the other end to a member 22 of the underframe.

Each beam 15 extends in a fore and aft direction and projects beyond the rear of dual wheels 10 and has fixed to its rear extremity an outwardly extending rigid bracket arm 23 which constitutes an extension of a cross member 29 hereinafter described and serves to support the lower end of a helical compression spring 24. The upper end of each helical compression spring is arranged to abut a part 25 of the underframe. It will be appreciated, however, that various other forms of springs may be employed such as blocks of resilient material such as rubber, or a system embodying a compressible fluid, or leaf springs. In the latter case, a leaf spring may be anchored at one end to each beam, so as to extend laterally thereof and may engage the vehicle frame at the other end.

As previously explained, the resistance to roll of the underframe will be taken at two points, one at the pivotal connection 19 i.e. where the longitudinal axis of the beam 15 intersects the axis of pivoting and at the point 28 of application of the force of the spring 24 on the part 25 of the underframe. It is convenient, however, to consider a single effective roll resisting force passing through the axis 26 of the wheel shaft and location 27 of this force may be determined by the intersection with the wheel axis 26 as viewed in plan of a line 30 connecting the pivot axis 19 with the point 28. It will be seen that the location of the effective roll resisting force is well outside the inner face of the dual wheel 10, which was the limiting location for spring suspension systems heretofore. It will be appreciated that the position 27 of the effective roll resisting force will not only be determined by the distance of the axis of the thrust of the spring 24 from a central fore and aft axis 9 of the vehicle, but also by the distance of the intersection of the beam 15 and the axis of the pivot pin 19. Thus if it were practicable to carry the latter point sufficiently far outwardly the compression spring 24 might be arranged over the beam 15, or in the arrangement shown if the point 27 was required to be carried further from the fore and aft axis 9, the pivotal connection 19 could be arranged further from the axis 9.

It will be appreciated that during roll, angular relationship of the two beams with respect to outer frame will differ and since the two beams are connected together by the axle casing, the beams will tend to twist about their longitudinal axes, this to a certain extent is accommodated by the resilient bushes 18. It will be noted however, that the rearward extremities of the beam 15 are connected together by an I section cross member 29, the torsional rigidity of which to a certain extent limits the differential swinging of the two beams and thus in itself acts as an anti-roll device, and this can be taken into account when determining the strength or rating of the springs 24.

What we claim is:—

1. A spring suspension system for a vehicle comprising a fore and aft extending beam on each side of an underframe or body of the vehicle, a pivotal connection between each beam and said underframe or body so as to permit relative up and down swinging movement between these parts, a mounting for a vehicle wheel on each beam, a vertically acting spring between the outer end of each beam or a part secured thereto and the underframe

or body resisting said swinging movement and means other than the wheel axle for connecting the two beams together near said springs so as to limit the differential swinging thereof.

2. A spring suspension according to Claim 1 wherein said means connecting together the two beams comprise a torsion bar.

3. A spring suspension system according to Claim 1, or Claim 2, wherein the point of application of the force of each said spring on the underframe and/or the pivotal attachment of each beam to the underframe is or are disposed outside a vertical fore and aft plane containing the inner face of the wheel for the purpose described.

4. A spring suspension according to any of the preceding claims, wherein each said spring between a beam and the underframe is arranged on the opposite side of the wheel to the pivotal attachment of its beam to the underframe or body.

5. A spring suspension system according to any of the preceding claims, wherein each said beam extends parallel or substantially parallel with the central longitudinal fore and aft axis of the vehicle.

6. A spring suspension system according to claim 4, wherein said spring between a beam and the underframe is supported at one end by a part constituting an extension of said connecting means for the two beams and at the other end is supported by said underframe.

7. A spring suspension system according to claim 5, wherein said spring between each beam and the underframe comprises either a helical spring, leaf spring, or a block of resilient material or a system embodying a compressible fluid.

8. A spring suspension system according to claim 5 wherein said spring between each beam and underframe comprises a leaf spring anchored at one end to said beam so as to extend laterally thereof while the other end engages the vehicle underframe.

9. A spring suspension system according to any one of the preceding claims, wherein each wheel bearing is resiliently mounted on said beam.

10. A spring suspension system according to any of the preceding claims, wherein the pivotal mounting for each said beam is torsionally resilient about the longitudinal axis of the beam.

11. A spring suspension system substantially as described with reference to the accompanying drawing.

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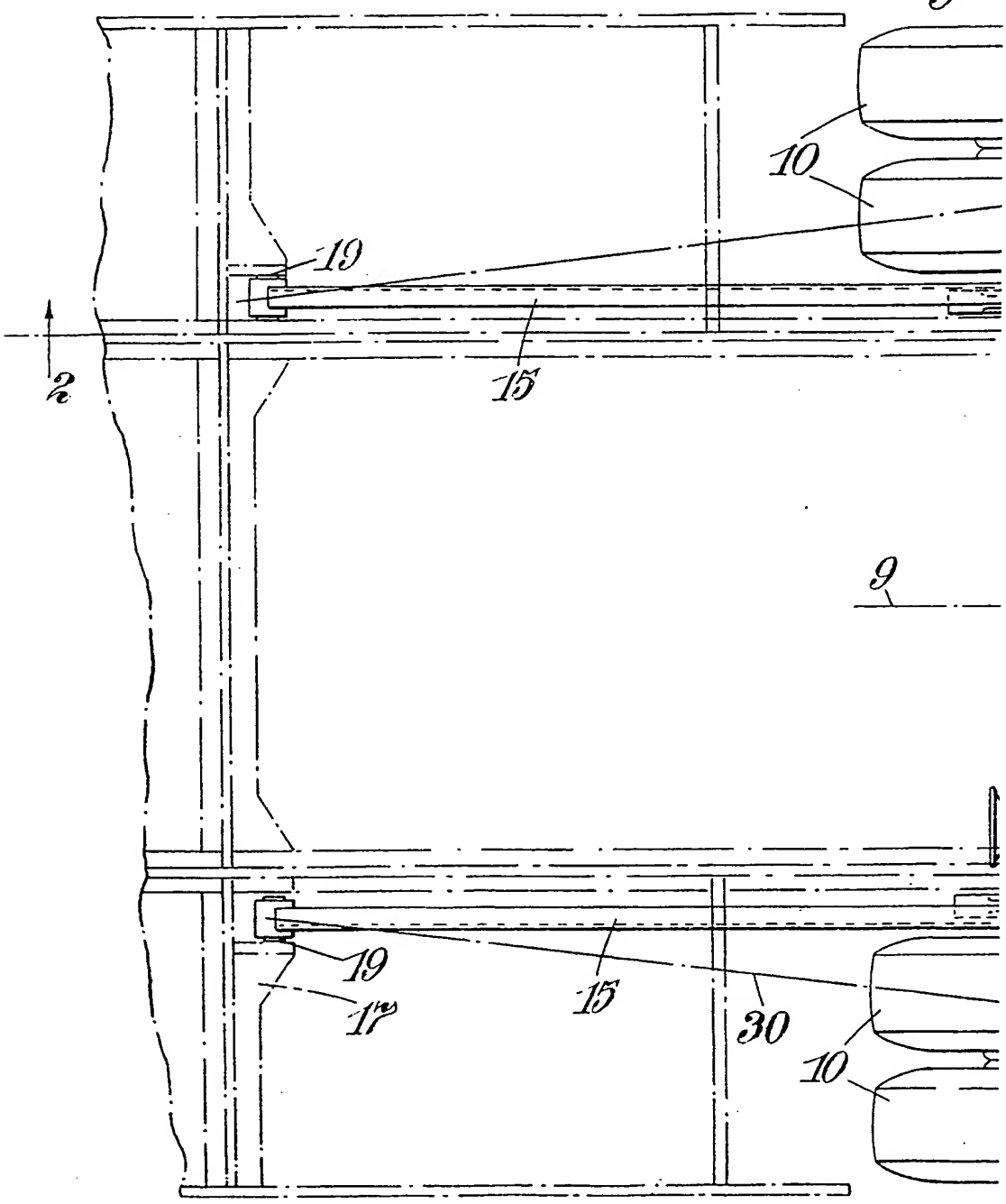
Chartered Patent Agents.

Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1955.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

Fig. 1



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2 SHEETS

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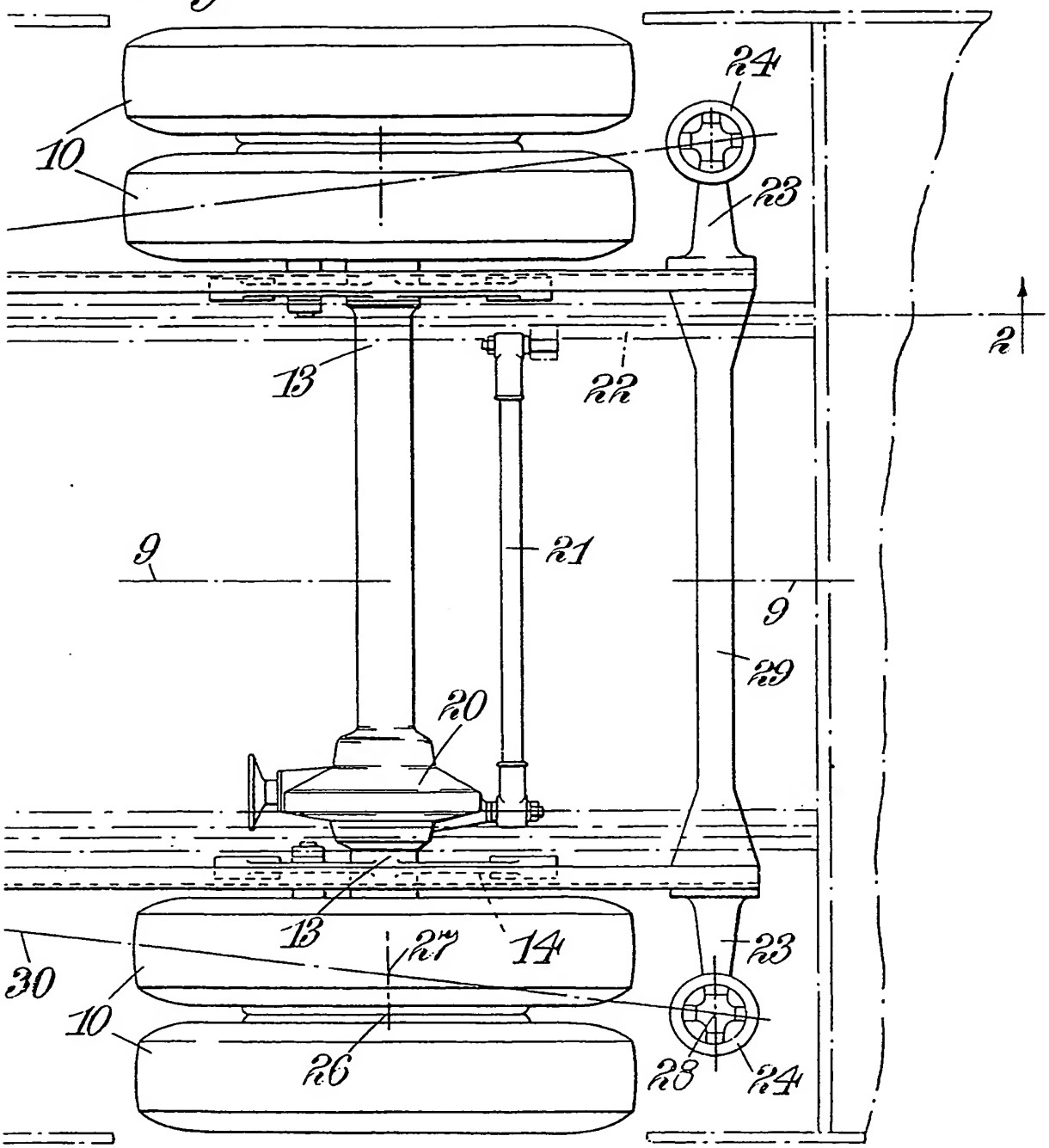
SHEET 1

Fig. 1.



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SHEET 1

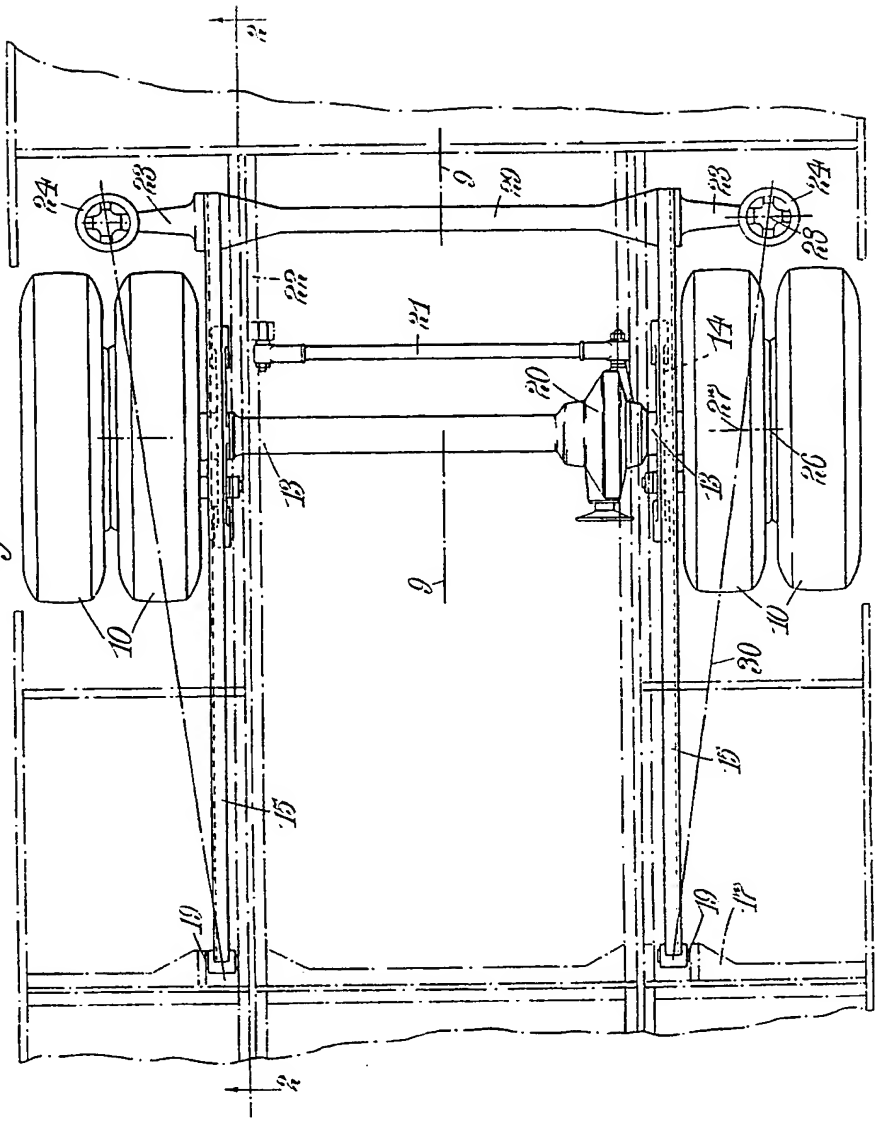
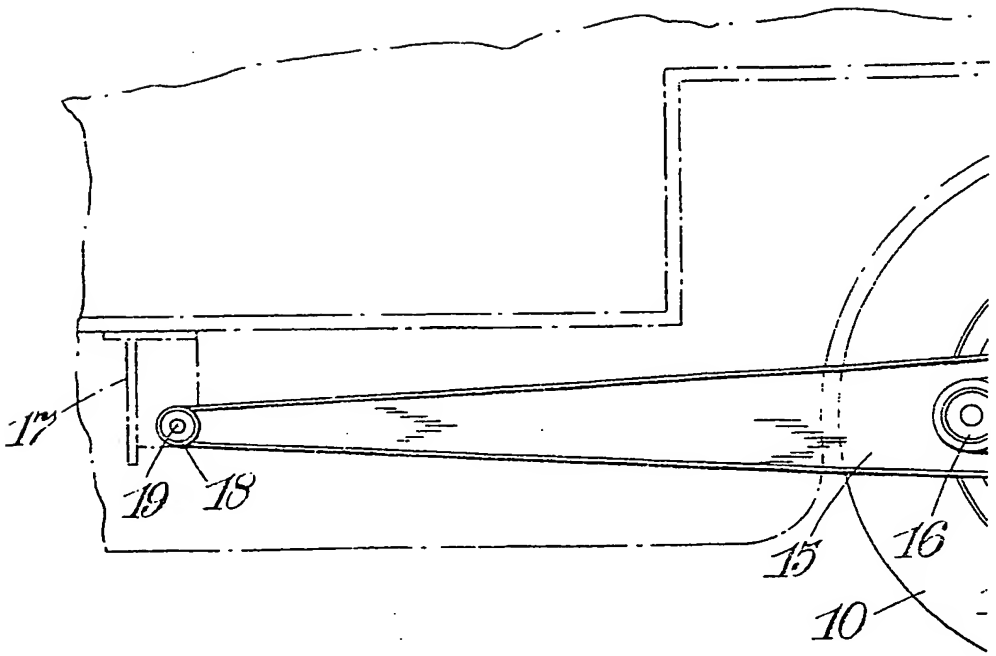


Fig.1.

Fig. 2.



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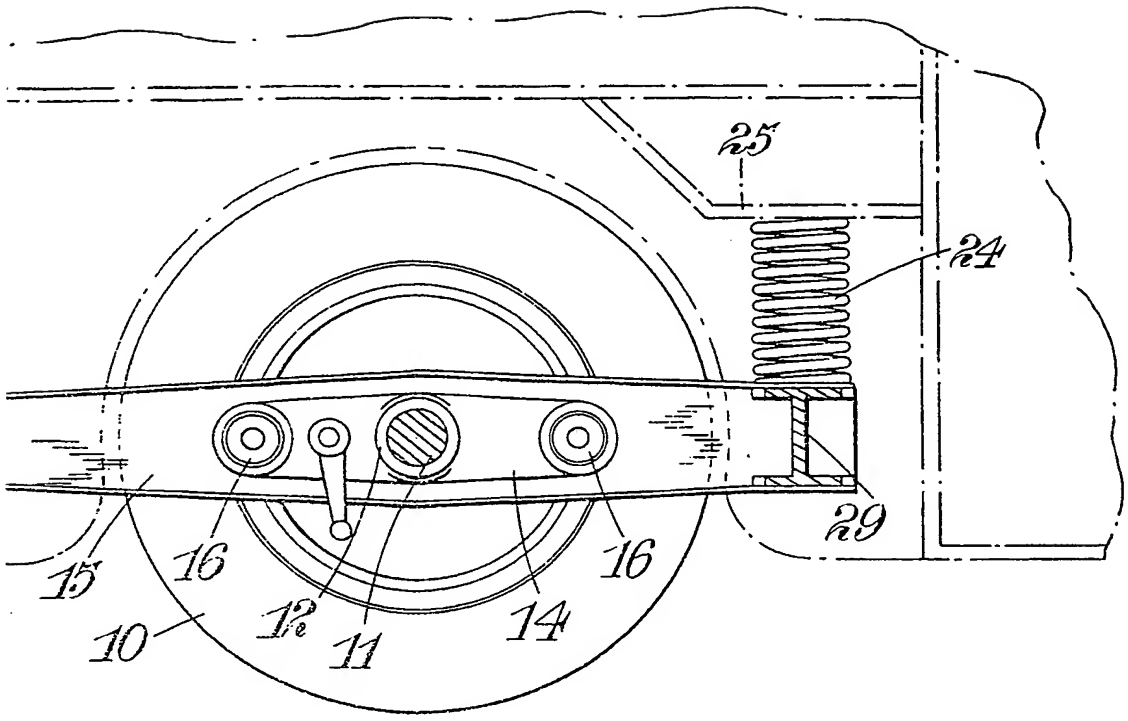
SHEET 2

Fig. 2.



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SHEET 2

Fig.2.